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SPECIFICATION

1. Title of the Invention

Rust preventive sheet

2. Claim

A rust preventive sheet consisting of a laminated body of a polyethylene terephthalate long fiber nonwoven fabric having a volatile inhibitor applied thereto and an impermeable film and having a surface shrinkage rate of 20% or more under heating at 80-150℃.

3. Detailed Description of the Invention

Usable Field in Industry

This invention relates to a rust preventive sheet for preventing the rusting of a metallic object. More specifically, it relates to a rust preventive sheet surface-shrinkable under heating, highly strong, and excellent in heat seal property, cushion property and rust preventive effect.

Prior Arts

Conventionally, as rust preventive sheets intended for the rust prevention of a metallic object mainly composed of iron ore, a rust preventive paper comprising a volatile inhibitor applied onto or impregnated in an inhibitor support such as paper, paperboard, polyethylene laminate paper,

waxed paper or the like is known.

Further, a rust preventive film using a film such as polyester, polyethylene or the like as the inhibitor support is also known.

However, in both the cases, the sealing, packaging or coating of the metallic object is performed so as to enclose it in order to effectively utilize the rust preventive effect. Therefore, the rust preventive paper and rust preventive film have a significant disadvantage in that a doubly or triply folded part is partially formed, and this folded part disturbs the volatilization of the volatile inhibitor to reduce the practical effect of the rust preventive paper by half.

These conventional products further have disadvantages of low strength because of the basic support consisting of paper and low tear strength in the rust preventive film because of its film shape, so that the damage quickly extends, when damaged by an impact, leading to the breakage of the packaging and the extinguishment of the rust preventive effect. When a paper laminated with a polyethylene film is used as the support, the ductility of the paper is small, compared with that of the film, the strength consequently substantially depends on the strength of the paper, and it has a similar disadvantage of low tear strength.

Problem to be Solved by the Invention

As the result of the earnest studies to improve the disadvantages possessed by the conventional products, the present inventors found that the conventional disadvantages can be improved by shrinking a rust preventive sheet by heating in use, and attained this invention.

This invention thus has an object to provide a rust preventive sheet having heat shrinkable function and excellent in tear strength, cushion property and rust preventive effect.

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Means to Solve the Problem

A rust preventive sheet according to this invention consists of a laminated body of a polyethylene terephthalate long fiber nonwoven fabric having a volatile inhibitor applied thereto and an impermeable film, and it has a surface shrinkage rate of 20% or more under heating at 80-150℃.

This invention is further more specifically described.

In this invention, the polyethylene terephthalate long fiber nonwoven fabric has a heat shrinkage rate of, preferably, 10%, more preferably, 12% or more in at least one of longitudinal and lateral directions. The upper limit of the heat shrinkage rate is practically preferably up to 70%, but it may exceed it. However, it is necessary that the deterioration of strength after heat shrinkage be minimized. The fineness of the fiber constituting the polyethylene terephthalate long fiber nonwoven fabric is preferably 30 deniers or less, more preferably, 0.5-15 deniers. METSUKE of 10-500 g/m^2 is preferably used, but it is not particularly limited to this.

As the volatile inhibitor, particularly, one group having volatility depending on molecular structure or molecular weight of organic inhibitors may be used, which basically has a proper vapor pressure and is sublimable in a sealed space to attain the purpose of rust prevention. Examples thereof include nitrite of organic amine such as dicyclohexylammonium nitrite or diisopropylammonium nitrite; carboxylate of organic amine; hydroxylamine; acid amide; and the like, and a mixture of a plurality thereof can be also naturally used without any particular limitation.

The impermeable film generally consists of a film of polyethylene, polystyrene, polyvinyl chloride or the like. Any film, if it is not particularly perforated, can be used. In the impermeable film, the difference between longitudinal and lateral heat shrinkage rates is preferably not so large.

When the difference is large, the laminated interface of the impermeable film with the polyethylene terephthalate long fiber nonwoven fabric is apt to partially peel into two layers. Therefore, it is not necessary, of course, to particularly limit the difference in shrinkage rate, if no peeling is caused.

The thickness of the impermeable film may be set to 10-500 μ without particular limitation. However, when it is less than 10 μ, the film is easily damaged with a low strength and a low resistance to impact. When it exceeds 500 μ, the handling is difficult in points of METSUKE weight and hardness, and the thickness is preferably set to 200 μ or less.

The polyethylene terephthalate long fiber nonwoven fabric is impregnated in an aqueous solution of a prescribed quantity of the volatile inhibitor dissolved to water, and sufficiently wringed, and the moisture is then dried under the working condition of a temperature where the polyethylene terephthalate long fiber nonwoven fabric is not shrunk at least 5% or more longitudinally and laterally.

As the effective working condition, the drying is desirably performed with a large quantity of air at a temperature of 50-60℃. Further, when the volatile inhibitor is hardly dissolved in water, a mixed solvent by the combined use of a lower alcohol such as methyl alcohol or ethyl alcohol may be adapted, and it goes without saying that the volatile inhibitor is used in the water-dispersed or emulsified state by the combined use with a small quantity of an emulsifier or dispersant. The application method of the volatile inhibitor is not limited to the above method by impregnation and wringing, and spray method, roll contact method, and a method of forming the volatile inhibitor in an inhibitor support, for example, by successively dipping raw materials used for the manufacture of the rust inhibitor followed by working, are often applied. Further, the adhesion quantity of

the volatile inhibitor may be set to 0.2g/m^2-50g/m^2, and the addition can be performed according to the generally used quantity without any particular limitation.

The polyethylene terephthalate long fiber nonwoven fabric having the volatile inhibitor applied thereto is laminated on the impermeable film. As the adhesive for the lamination, a general resin or rubber such polyacrylate, polyvinyl acetate, or styrene/butadiene rubber may be used regardless of emulsion type or organic solvent type, and as the application method of the adhesive, also, roll contact method, spray method or coating method can be used without any particular limitation. Naturally, it is preferable that the adhesive is not impregnated into the inner part of the nonwoven fabric so as not to disturb the sublimation of the volatile inhibitor. Further, the adhering method by the adhesive is not particularly limited. The adhesive strength between the nonwoven fabric and the film can be set to a peeling strength of 50 g or more against a width of 3 cm, preferably, 100 g or more.

It is further important that the rust preventive sheet obtained by superposing and laminating the nonwoven fabric and the film has a surface shrinkage rate of 20% or more. The surface shrinkage rate (%) is expressed by the following equation.

Surface shrinkage rate (%) = 100 − (100 − longitudinal heat shrinkage rate)
× (100 − lateral heat shrinkage rate)/100

When the surface shrinkage rate is less than 20%, the sheet is hardly closely fitted to a three-dimensional metallic object and cannot exhibit an efficient rust preventive effect. The upper limit of the surface shrinkage rate is about 90%, but it is not particularly limited to this.

The measurement methods of characteristics shown in Example of

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this invention are described below.

METSUKE: JIS-L-1079

Thickness: JIS-L-1079

Tear Strength: JIS-L-1079 (Pendulum method)

Heat Shrinkage Rate: A 25cm x 25cm sample is marked in a position of 20cm each in length and breadth, and put in a hot air dryer at 120℃ for 2 minutes, and the dimensional change of the sample is measured to show the respective shrinkage rates by average values.

Heat Seal Property: Two 25cm x 25 cm samples are superposed, and electrically pressed and adhered for 6 seconds by use of an impulse type heat sealer (FUJI KOGYO KK) 100V, 500-800 W, the adhesive part is sampled in a width of 3 cm to measure the peeling strength of the adhesive part by use of a tensile testing machine, and the maximum resistance value is divided by the width 3cm to determine the heat seal property (g/cm).

Example

In the manufacture of a polyethylene terephthalate long fiber nonwoven fabric by a general span bond manufacturing process, a polyethylene terephthalate discharged through a spinning base was drawn at a spinning speed 2300 m/min by a high-speed air jet flow while blowing cold air to just under the spinning base to provide an uniform web with fineness of 3.5 deniers and METSUKE of 50g/m^2, and it was thermally pressed between an emboss roll consisting of an upper roll having protruding parts uniformly arranged thereon and a lower roll having a smooth surface. The area ratio of the thermally pressed part was 12%, and the temperature of the upper and lower rolls was 75℃. The heat shrinkage rate of the resulting heat shrinkable polyethylene terephthalate long fiber nonwoven fabric was 58% in length and 46% in breadth.

As the volatile inhibitor, 4% aqueous solution of dicyclohexylammonium nitrite was prepared, and the above heat shrinkable polyethylene terephthalate long fiber nonwoven fabric was dipped therein, wringed, and dried by use of a hot air dryer of 70℃. The adhesion quantity of the inhibitor was about 2.0 g/m^2. A heat shrinkable polyethylene film 30 μ thick with heat shrinkage rates of 60% in length and 50% in breadth was adhered to the heat shrinkable polyethylene terephthalate long fiber nonwoven fabric having the volatile inhibitor applied thereto by use of a polyacrylate adhesive. The characteristics in ordinary state and the characteristics after heating at 100℃ for 30 seconds are shown in Table 1.

As a comparative example, the same volatile inhibitor as in Example was applied to a craft paper with METSUKE 50g/m^2 by kiss roll method, and dried with a hot air dryer of 105℃. The adhesion quantity of the volatile inhibitor was about 2.0 g/m^2. Then, a polyethylene film 30 μ thick was then extruded by use of a fusing extruding machine to directly laminate the craft paper. The characteristics in ordinary state and the characteristics after heating at 110℃ for 30 seconds are shown in Table 1.

As shown in Table 1, the rust preventive sheet according to this invention has a large thickness. This shows that it has high cushion property. The tear strength is also overwhelmingly high. This shows that this sheet is highly resistant to impact, scratch or the like in use. Further, the heat seal strength is high, so that sewing and bonding can be performed by heat seal, and this means that this sheet shows excellent sealing property to the sublimation of the inhibitor and is excellent in rust preventive effect.

Surprisingly, this sheet is further increased in thickness, when heated and shrunk, to enhance the cushion property and more closely fitted to the metallic object in use to make the effect of the inhibitor more effective,

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and also provides a beautiful appearance as packaging form.

Table 1

		METSUKE (g/m^2)	Thick. (mm)	Surface shrinkage rate (%)	Heat shrinkage rate (%)		Tear strength (g)		Heat seal property (kg/cm)
					Length	Breadth	Length	Breadth	
Example	Ordinary state	68	0.28	0	51	44	3470	2320	1.2
	After heat treatment	245	1.56	73	4	2	8240	6450	1.1
Comp. Example	Ordinary state	70	0.09	0	1	1	31	33	0
	After heat treatment	71	0.09	2	0	0	30	29	0

Effect of the Invention

The rust preventive sheet according to this invention consists of a laminated body of a polyethylene terephthalate long fiber nonwoven fabric having a volatile inhibitor applied thereto and an impermeable film, and has a surface shrinkage rate of 20% or more under heating at 80-150℃. Therefore, it is preferably used as an industrial shrinkable packaging material. This sheet is increased in thickness to provide excellent cushion property, when a precision instrument part, tool, or mechanical part, for example, is packaged by shrinkage, and also excellent in physical characteristics such as tear strength or the like, and can exhibit the rust preventive effect that is the object of this invention.

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